(Model.)

C. H. ROBINSON.

TUBE EXPANDER.

No. 381,583. Patented Apr. 24, 1888.

Fig. 1

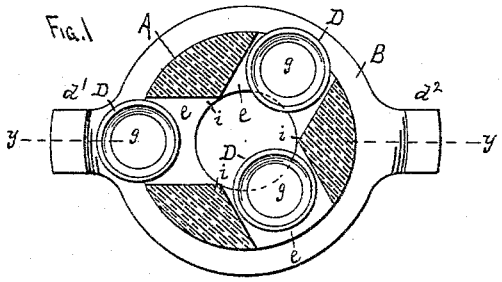


Fig. 3

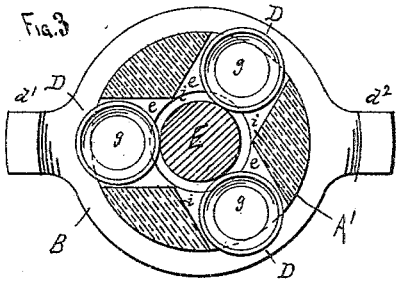


Fig. 2

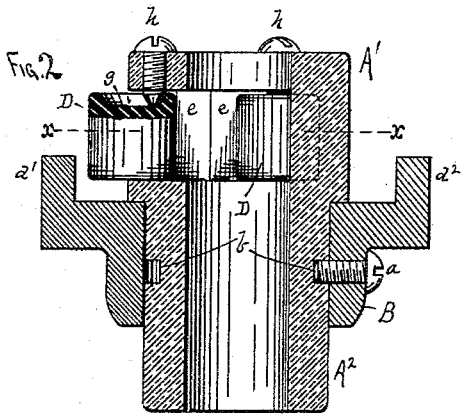


Fig. 4

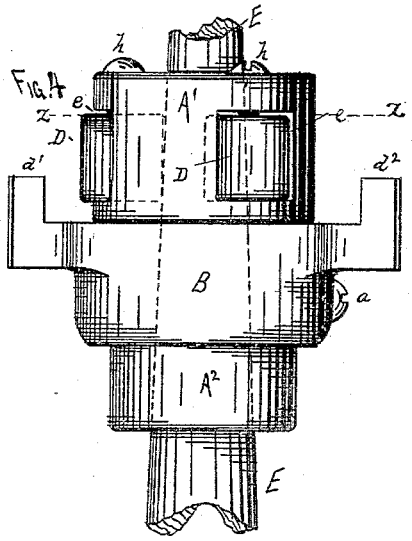
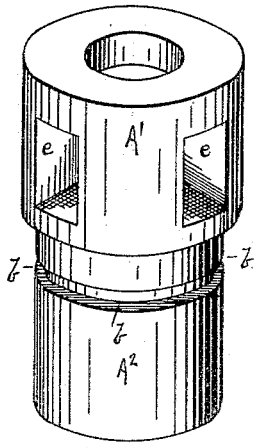


Fig. 5



WITNESSES.
Morley & Clough.
H. S. Webster.

Charles H. Robinson.
INVENTOR, BY
Charles N. Woodward,
Atty.

UNITED STATES PATENT OFFICE.

CHARLES H. ROBINSON, OF ST. PAUL, MINNESOTA.

TUBE-EXPANDER.

SPECIFICATION forming part of Letters Patent No. 381,583, dated April 24, 1888.

Application filed December 21, 1885. Serial No. 186,399. (Model.)

To all whom it may concern:

Be it known that I, CHARLES H. ROBINSON, a citizen of the United States, and a resident of St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Tube-Expanders, of which the following is a specification.

In the drawings, Figure 1 is a cross-sectional view on the line *x x* of Fig. 2. Fig. 2 is a sectional elevation on the line *y y* of Fig. 1. Fig. 3 is a cross sectional view on the line *z z* of Fig. 4; and Fig. 4 is a side elevation of the implement complete, the tapered expanding-bar being shown in position in Figs. 3 and 4. Fig. 5 is a perspective view of the solid "head" of the implement, with the expanding-rollers and supporting-collar removed.

A′ represents the main body or head portion of the implement, having its lower portion, A^2, reduced and encircled by a collar, B, the latter fitting loosely upon and adapted to be revolved freely around the part A^2, but prevented from being removed therefrom by a set-screw, *a*, fitting into a channel, *b*, in the part A^2. The collar B is provided with lugs d' d^2, projecting from opposite sides of its periphery, to form stops to rest against the flue-sheet and support the implement in its proper place in the tube. The head A′ and part A^2 are formed in one piece, and with a hollow interior provided with cavities *e* through the head A′ from the outside into its hollow interior, as shown, and into each of these cavities is inserted a roller, D, each roller being greater in diameter than the thickness of the metal of the part A′, so that when arranged as shown in Fig. 3 the rollers will project into the hollow interior of the head and also beyond its exterior. The upper ends of the rollers D are formed with recesses *g*, (see Figs. 1, 2, and 3,) and into each of these recesses the lower end of a set-screw, *h*, fits, the latter being tapped down through the top of the head A′. The lower points of the screws thus serve as stops to prevent the rollers from falling out of the cavities *e* when the implement is not in use. In Fig. 2 one of these rollers D is shown partially in section, with the lower end of one of the screws *h* projecting down into its recess *g*, this roller in this figure being shown at its outermost point. In Fig. 1 one of the rollers D is shown at its outermost point, one at its innermost point, and the remaining roller at an intermediate point, to illustrate the extent to which the rollers are free to be moved.

In using this implement the head A′ is inserted into the tube to be expanded, with the lugs d' d^2 against the flue-sheet. A tapered bar or mandrel, E, is then driven in from the outside through the hollow interior of the head A′ and reduced part A^2. The head A′ is smaller than the tube to be expanded, so that only the rollers D come in contact with the interior of the tube, and the bar E, being smaller than the interior of the head A′ A^2, acts only on the rollers and forces them outward against the interior of the tube. The bar E is then revolved in the head A′ A^2, which serves to roll the rollers D upon the interior of the tube and press it very tightly against the edges of the flue-sheet, and forms a steam tight joint between the tube and flue-sheet.

I have shown three of the rollers D in the head A′, which will be the number usually employed; but a greater number may be employed, if required.

By forming the head A′ A^2 in one single piece of metal I am enabled to produce the implement at a greatly-reduced cost, while at the same time it is stronger and more durable than if it were made in two or more parts connected by screws or rivets. I also claim a great advantage by my manner of preventing the roller D from falling out of the cavities *e* by the large recesses *g* in their upper ends, into which the lower points of the screws *h* fit. These screws *h* are never subjected to a greater strain than the weight of the roller when the implement is not in use or when being carried about.

The rollers can never come in contact with the screws *h* when the implement is in use, as will be readily understood by the construction, the strains being all borne by the solid metal of the head A′ at *i* between the cavities *e*.

Recesses *g* may be formed in both ends of the rollers D, and two sets of the pins or screws *h* used, or the recesses may be formed in the ends of the roller next the collar B, as in Fig. 7.

Having thus described my invention, what I claim as new is—

1. In a tube-expander, a head having a cen-

tral longitudinal bore, and channels extending radially and laterally through said head and communicating with said central bore, in combination with expanding-rollers located in said radial channels, each of said rollers having on one end a cavity or recess, and stop-pins inserted through the head of the tube-expander, with their ends entering the recesses in said rollers, substantially as set forth.

2. In a tube-expander, a head cast or formed in a single piece having a central longitudinal bore, and channels extending radially and laterally through said head and communicating with said central bore, in combination with expanding-rollers located in said radial channels, each of said rollers having on one end a cavity or recess, and stop-pins inserted through the head of the tube-expander, with their ends entering the recesses in said rollers, substantially as set forth.

3. In a tube-expander, a head having a central longitudinal bore and channels extending radially and laterally through said head and communicating with said central bore, in combination with expanding-rollers located in said radial channels, each of said rollers having on one end a cavity or recess and having its opposite end plain and square, and stop-pins inserted through the head of the tube-expander, with their ends entering the recesses in said rollers, substantially as set forth.

4. As a new article of manufacture, an expanding-roller for a tube-expander, said roller having one end plain and square and having a cavity or recess in the opposite end, substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CHARLES H. ROBINSON.

Witnesses:
E. L. HEMENWAY,
C. N. WOODWARD.